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# 1989 Insect Pest Management Guide

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### Special Review of Dichlorvos

Many insecticide products containing dichlorvos (DDVP) are registered and commonly used to control pests of livestock. Among such products are Ciovap (dichlorvos plus crotoxyphos), Ravap (dichlorvos plus stirofos), resin strips known as "No-Pest Strips" and "Farm Strips," Vapona (liquid concentrates and dry bait), and dichlorvos horse wormers.

As a result of studies commissioned by the National Toxicology Program, the U.S. Environmental Protection Agency (U.S. EPA) has recently classified dichlorvos as a probable human carcinogen. The U.S. EPA has initiated a special review of dichlorvos to evaluate the benefits and risks associated with its use in a variety of pest-control situations. The results of that review will determine the future of dichlorvos registrations and uses.

Until further information clarifies the risks associated with the use of dichlorvos, and until the special review results in continuation or cancellation of current registrations, livestock producers are advised not to purchase products containing dichlorvos. Although the use of dichlorvos according to label directions during the special review is legal, curtailing this use reduces any risks to human health during this process. For that reason, all listings of dichlorvos uses have been deleted from the 1989 issue of this publication.

Successful pest management is an essential part of efficient and profitable livestock production. Although pest-related losses are often inconspicuous, flies, lice, mites, and ticks can cause significant reductions in meat, milk, wool, and egg production. Several livestock pests also transmit important diseases.

Effective management of livestock pests should include the use of cultural, mechanical, and biological control tactics as well as the application of chemical insecticides. Insecticides should be viewed as supplements to, not replacements for, sanitation and sound cultural practices. Used properly, insecticides efficiently reduce pest populations without injuring livestock or threatening the safety of either the pesticide applicator or the ultimate consumer of animal products.

This publication provides recommendations for safe and effective use of livestock insecticides. It is revised annually; always use the current year's issue. Registration changes that occur between revisions will be announced

to appropriate media sources and county Extension offices. If you have questions about the use of insecticides for livestock insect management, consult your county Extension adviser.

Selection of the insecticides listed on the following pages was based on EPA registrations and on efficacy data reported by entomologists of the University of Illinois College of Agriculture, the Illinois Natural History Survey, and other midwestern universities. If listed insecticides fail to provide pest control, please contact your county Extension adviser or the Entomology Extension office at the University of Illinois.

**Additional sources of information.** In the tables, leaflets outlining the life history, biology, and habits of livestock pests are indicated by the letters "NHE" and the leaflet number. Request these leaflets at your county Extension office or from Entomology Extension, 172 Natural Resources Building, 607 East Peabody Drive, Champaign, Illinois 61820. Additional pest management



publications available from the Office of Agricultural Publications (54 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801) include Circular 899, *1989 Insect Pest Management Guide: Field and Forage Crops*; Circular 900, *1989 Insect Pest Management Guide: Home, Yard, and Garden*; Circular 925, *Insect Pests of Cattle*; Circular 897, *1989 Insect Pest Management Guide: Commercial Vegetable Crops*; and Circular 1136, *Alfalfa Weevil Pest Management Program*.

**Using livestock insecticides.** The pesticide user is always responsible for the results of insecticide applications to his livestock and crops, as well as for problems of pesticide drift and contamination. All users should observe the following rules.

- Read the label and follow directions and safety precautions. Be sure that the insecticide is specifically labeled for the pest and animal in question and the application method planned. **THE LABEL IS THE LAW.**
- Use face masks or respirators and protective clothing during spraying. Avoid breathing spray mist or dust.
- If pesticides are spilled on the skin or clothing, wash thoroughly with soap and water and change clothes.
- Do not eat, drink, or smoke when handling pesticides.
- Provide adequate ventilation when applying pesticides.
- Do not exceed registered rates of application. Improper or excessive applications can endanger livestock and result in illegal residues in meat and milk.
- Obey the preslaughter interval listed on the label.
- Avoid drift to adjacent cropland, yards, woodlots, lakes, or ponds. Some materials may injure or kill fish, wildlife, and crops.
- Do not treat animals that are sick, overheated, or stressed from shipping, dehorning, castration, recent weaning, and other causes.
- Avoid contamination of feed, mangers, water, milk, and milking equipment.
- Do not spread treated manure on crops that are not listed on the pesticide label.
- Accurately record all pesticide usage. Include the pesticide's trade name, formulation, dilution, application rate, and date of treatment.
- Store pesticides in their original, labeled containers, safely locked away from children, pets, and livestock.

**NOTE:** The information in the following tables is for educational purposes only. Reference to commercial products or trade names does not constitute an endorsement by the University of Illinois and does not imply discrimination against other similar products. Trade names are presented for reasons of clarity only. The reader is urged to exercise the usual caution in making purchases or evaluating product information.

- Dispose of empty pesticide containers promptly and properly according to specified recommendations. Do not breathe smoke from burning containers.
- Contact a physician at once in all cases of suspected poisoning. Symptoms of organophosphate poisoning include blurred vision, abdominal cramps, and tightness in the chest.

**Poison Resource Centers.** The Poison Resource Centers listed below have been established to provide information about the treatment of poisoning cases. Anyone with a poisoning emergency can call the toll-free telephone number for help. Personnel at the Resource Center will provide first-aid information and refer callers to local treatment centers if necessary.

Poison Resource Centers supplement, but do not replace, local emergency medical services. Do not delay calling local emergency medical personnel to request immediate assistance or transportation. If possible, have the pesticide container and label present when you call or reach a treatment center or hospital.

*Chicago and northeast Illinois*

1753 West Congress Parkway  
Chicago, Illinois 60612  
Telephone: 800-942-5969

*Northern and central Illinois*

530 N.E. Glen Oak  
Peoria, Illinois 61603  
Telephone: 800-322-5330

*Central and southern Illinois*

800 East Carpenter  
Springfield, Illinois 62702  
Telephone: 800-252-2022

**Preventing livestock poisoning.** Every year livestock animals die after consuming pesticide granules, wettable powders, or dusts that have been spilled on trucks, wagons, or soil surfaces. Animals consume the pesticide alone or with feed grains or forage placed on the contaminated surface. Prevent livestock poisoning by properly containing and disposing of spilled pesticides and by storing all pesticides in locked facilities that are inaccessible to domestic and wild animals, as well as to children.

# Beef Cattle and Nonlactating Dairy Cattle

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE</b> (NHE 18)  $\frac{1}{16}$ to $\frac{1}{8}$ inch long. Biting lice are reddish, flattened, and active. Sucking lice are gray to blue and sluggish. Heavy populations cause poor growth, general unthriftiness, and anemia. Symptoms are rough, patchy hair coats and a dirty appearance. Lice are most troublesome when cattle are crowded in shelters during winter months.		Self-treatment devices such as back rubbers, face rubbers, and dust bags effectively control lice when used in conjunction with systemic insecticides applied from August through October for grub control. The systemics kill lice that are present on animals during the fall; the self-treating devices then hold louse populations below economic levels throughout the winter. Place rubbing devices and dust bags where cattle will use them. For back rubbers and face rubbers, mix insecticides with No. 2 fuel oil, No. 2 diesel fuel, or an oil recommended on the insecticide label. Mineral oil is less irritating than fuel oil. Do not use waste oil or motor oil. Keep dust bags dry. Service self-treating devices at least once per month.		
	Back rubber or face rubber (oilers)	Co-Ral 11.6% EC (coumaphos)	1 gal/13 gal fuel or mineral oil.	0 days. Do not apply with oral drenches, with other internal medications such as phenothiazine, or with natural or synthetic pyrethroids, synergists, or organophosphates.
		malathion 57% EC	0.5 pt/1.5 gal fuel or mineral oil.	0 days.
	Dust bag	Products listed for use in dust bags can also be applied by hand-dusting. Follow label directions.		
		Co-Ral 1% D (coumaphos)	10 lb dust/bag. Use 1 bag/10-20 head.	0 days.
		Ectiban or Permethrin 0.25% D (permethrin)	10 lb dust/bag. Use 1 bag/10-20 head.	0 days.
		Rabon 3% D (stirofos)	4-8 lb dust/bag. Use 1 bag/10-20 head.	0 days.
	Spray	Apply sufficient spray to thoroughly wet each animal. Use up to 1 gallon finished spray per animal. Do not contaminate feed or water.		
		Co-Ral 11.6% EC or 25% WP (coumaphos)	2 qt 11.6% EC or 2 lb 25% WP/100 gal water.	0 days. Do not treat calves less than 3 months old or sick, convalescent, or stressed cattle. Do not spray within 10 days after shipping, weaning, or disease exposure. Do not spray in nonventilated areas. Do not apply in conjunction with other organophosphates, pyrethroids, synergists, or phenothiazine.
		Delnav 15% EC or 30% EC (dioxathion)	1 qt 15% EC or 1 pt 30% EC/25 gal water.	0 days. Do not treat more often than every 14 days. Do not use on dairy cattle or in dairy barns. Restricted-use.
		Ectiban 5.7% EC (permethrin)	1 qt/100 gal water.	0 days. Repeat treatment 14-21 days after first application. Do not treat more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for control of lice on beef cattle. Check product labels for dilution and application rates.)		
		malathion 57% EC	1 gal/100 gal water.	0 days. Do not apply to lactating dairy cattle or within 14 days of freshening. Do not treat calves less than 1 month old.
		Rabon 50% WP or 24% EC (stirofos)	4 lb 50% WP/75 gal water or 1.5 gal 24% EC/100 gal water.	0 days. Beef cattle only.
		methoxychlor 25% EC or 50% WP	2 qt 25% EC or 2 lb 50% WP/25 gal water.	0 days. Repeat treatment 14-21 days after first application. Do not use on dairy cattle or in dairy barns.
		Taktic 12.5% EC (amitraz)	1 qt/100 gal water. Use up to 2 gal spray per fully grown animal.	0 days. Apply spray within 6 hours after mixing. Repeat application in 10-14 days.
	Pour-on or spot-on	Fall applications of systemic pour-ons and spot-ons such as Co-Ral (coumaphos), Warbex (famphur), Tiguvon (fenthion), Neguvon (trichlorfon), and Prolate (phosmet) for grub control also reduce louse populations. These treatments may not provide season-long louse control through the winter. Follow label directions concerning reuse after grub treatment cut-off dates. Products listed below effectively control lice, but do not provide grub control.		
		Dursban 44 (chlorpyrifos)	2 cc/100 lb body weight	14 days. Beef cattle only. Apply as spot treatment. Do not exceed 16 cc/animal. Do not treat calves under 3 months old or bulls over 8 months old. Do not treat purebred continental or exotic breed cattle such as Charolais, Chianina, Simmental, and Gelbveih. Do not retreat within 30 days. Do not use on cows within 21 days prior to calving or 14 days after calving.



# Beef Cattle and Nonlactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
LICE, cont.	Pour-on or spot-on, cont.	Lysoff 7.6% EC (fenthion)	1 pt/1 gal water. Use 1 fl oz/100 lb body weight.	21 days; 35 days if 2 applications are made. Do not apply within 28 days of freshening of dairy cattle. Pour evenly along back line. Do not treat calves under 3 months old or sick, convalescent, or stressed livestock. Do not use with other cholinesterase-inhibiting insecticides or drugs.
	Injection	Ivomec 1% (ivermectin)	Ready to use. 1 cc/110 lb body weight.	35 days. Inject subcutaneously. Use aseptic procedures. Do not use on dairy cattle of breeding age.

## CATTLE GRUBS

Larvae ("grubs") bore through the skin and migrate within the host to the skin of the back. Light infestations cause little or no reduction in the rate of gain or in feed efficiency. Hide damage can be economically important if cattle are slaughtered during the spring or early summer following grub emergence. The hairy, yellow and black adult flies, slightly smaller than honey bees, annoy grazing cattle.

Timing of grub control treatments is important. Systemic insecticides applied as pour-ons, spot-ons, or sprays travel within the animal's bloodstream and should be applied to control grubs 6 to 8 weeks before they migrate to the animal's back. Late treatments may cause host-parasite reactions with symptoms of bloat, hindquarter paralysis, or death. Systemic insecticides should be used on native beef cattle herds in August or September in southern Illinois, and in September or October in the northern half of the state. For native cattle, treat only summer-pastured cattle in areas with histories of grub problems. Animals in confinement are not attacked by ox warble flies (heel flies). Heel fly season and grub treatment dates are earlier for cattle grazed in southern states. Cattle feeders should either know the origin of feeder cattle to determine grub treatment dates or should purchase only cattle that have received grub treatments.

Do not apply systemic insecticides in conjunction with or immediately after phenothiazine, with pyrethrins or synthetic pyrethroids or their synergists, or with other organophosphate insecticides. Do not treat cattle under stress from castration, dehorning, weaning, shipping, illness, or overexertion. Do not treat calves less than 3 months old.

Pour-on	Apply pour-ons using a long-handled dipper supplied by the manufacturer. Apply to the back line from the shoulder to the hip.		
	Co-Ral 4% (coumaphos)	Ready to use. Apply 0.5 fl oz/100 lb body weight.	0 days. Do not apply within 14 days of freshening of dairy cattle.
	Neguvon 8% (trichlorfon)	Ready to use. Apply 0.5 fl oz/100 lb body weight. Do not exceed 4 fl oz/animal.	21 days. Do not apply within 7 days of freshening of dairy cattle.
	Prolate (GX-118) 11.6% E (phosmet)	1 gal/2 gal water. Apply 1 fl oz/100 lb body weight. Do not exceed 8 fl oz/animal.	21 days. Do not apply to dairy animals.
	Tiguvon 3% (fenthion)	Ready to use. Apply 0.5 fl oz/100 lb body weight.	35 days. Do not apply within 28 days of freshening of dairy cattle.
	Warbex 13.2% (famphur)	Ready to use. Apply 0.5 fl oz/100 lb body weight. Do not exceed 4 fl oz/animal.	35 days. Do not apply within 21 days of freshening of dairy cattle. Do not use on Brahmans or Brahman crossbreeds.
Spot-on	To apply spot-ons, use the applicator system provided by the manufacturer. Apply the material to a single location on the back midline.		
	Spotton 20% (fenthion)	Ready to use. Apply 4 cc/300 lb body weight. Do not exceed 20 cc/animal.	45 days. Do not treat dairy cattle of breeding age.
Spray	Use high-pressure sprays (250-350 psi) to apply 3 to 4 quarts of finished spray per animal. Because few farm sprayers generate sufficient pressure for proper application, veterinarians and commercial applicators with appropriate livestock spray equipment should be contacted to apply grub sprays. Use a pencil stream of spray directed at right angles to the sides and back. Treat 10 or fewer animals at one time. Do not contaminate feed or water.		
	Co-Ral 25% WP or 11.6% EC (coumaphos)	12-16 lb 25% WP or 8-12 qt 11.6% EC/100 gal water.	0 days. Do not apply within 14 days of freshening of dairy cattle.
	Prolate (GX-118) 11.6% EC (phosmet)	2 gal/100 gal water.	21 days. Beef cattle only.
Injection	Ivomec 1% (ivermectin)	Ready to use. 1 cc/110 lb body weight.	35 days. Inject subcutaneously. Use aseptic procedures. Do not use on dairy cattle of breeding age.

# Beef Cattle and Nonlactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>MANGE MITES</b>  Microscopic mites live on the skin or burrow into it. Lesions vary with mite species. Infestations are greatest when cattle are crowded in shelters during winter months.		Chorioptic mange is the most prevalent mite-induced disorder of Illinois cattle. Infested cattle may or may not develop lesions; lesions usually occur as localized nodules that exude serum. They are most numerous from the tailhead to the hind heels. Insecticides listed previously for louse control on beef cattle also control chorioptic mange mites. Cattle scabies (psoroptic mange) is a quarantinable disease. Its symptoms are lesions that occur first on the withers, over the back, and at the tailhead. Small wounds cause itching, and rubbing leads to abscesses, especially on the shoulders and rump. Mites move to edges of scabs, causing lesions to enlarge and coalesce. Scabs may cover much of the body. Where cattle scabies is detected, contact the Illinois Department of Agriculture, Bureau of Animal Health, Illinois State Fairgrounds, Springfield, Illinois 62706, (217) 782-4944.		
<b>TICKS</b>  8-legged adults of most species are reddish brown and less than ¼ inch long. Engorged females may exceed ½ inch in length. Ticks are blood feeders and disease vectors.		Ticks rarely pose an economic threat to cattle in Illinois. Problems are most likely where cattle graze in brushy or wooded areas.		
	Spray	Apply sufficient spray to thoroughly wet each animal; use up to 1 gallon finished spray per animal. Do not contaminate feed or water.		
		Co-Ral 25% WP or 11.6% EC (coumaphos)	4 lb 25% WP or 1 gal 11.6% EC/100 gal water.	0 days. Do not treat calves less than 3 months old or sick, convalescent, or stressed cattle. Do not spray within 10 days after shipping, weaning, or disease exposure. Do not spray in nonventilated areas. Do not apply in conjunction with phenothiazine, pyrethroids, synergists, or systemic organophosphate insecticides.
		Ectiban 5.7% EC (permethrin)	1 qt/100 gal water.	0 days. Do not apply more than once every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for control of ticks on cattle. Check product labels for dilution and application rates.)		
<b>MOSQUITOES</b>  Annoyance may cause cattle to bunch in or near buildings and reduce their grazing.		malathion 57% EC	1-2 gal/100 gal water.	0 days. Do not apply to dairy cattle within 14 days of freshening. Do not treat calves less than 1 month old.
		Taktic 12.5% EC (amitraz)	1 qt/100 gal water. Use up to 2 gal spray per fully grown animal.	0 days. Apply spray within 6 hours after mixing. Repeat application in 10-14 days.
<b>MOSQUITOES</b>  Annoyance may cause cattle to bunch in or near buildings and reduce their grazing.	Spray (to animals)	Ectiban 5.7%	1 qt/100 gal water.	0 days. Do not apply more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of mosquitoes and horse flies on cattle. Check product labels for dilution and application rates.)		
		pyrethrin (0.1%) plus synergist	Mist 1-2 fl oz/animal.	0 days. Do not contaminate feed or water. Do not wet skin.
<b>HORSE FLIES, DEER FLIES (NHE 60)</b>  Large flies that feed on the back, shoulders, neck, and head. Blood feeding annoys cattle and reduces grazing and weight gain. Wounds attract other flies.		Adequate and practical control methods for horse flies and deer flies on pastured beef cattle are not available. Insecticide applications provide some relief but do not provide long-term control. Place cattle in barns or sheds to protect them from horse flies and deer flies.		
	Spray	Ectiban 5.7%	1 qt/100 gal water.	0 days. Do not apply more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of mosquitoes and horse flies on cattle. Check product labels for dilution and application rates.)		
<b>HORSE FLIES, DEER FLIES (NHE 60)</b>  Large flies that feed on the back, shoulders, neck, and head. Blood feeding annoys cattle and reduces grazing and weight gain. Wounds attract other flies.		pyrethrin (0.5-1.0%) plus synergist	0.5% oil is ready to use; apply 2 fl oz/animal 3 times per week. Mix 1 gal 1% EC/10 gal water; apply 1 to 2 pt/animal every 3 days.	0 days. Apply to head, back, sides, belly, and legs. Do not contaminate feed or water.



# Beef Cattle and Nonlactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>PASTURE FLIES (HORN FLIES, FACE FLIES, STABLE FLIES)</b>  <b>Horn flies</b> (NHE 59) are smaller than house flies but are similarly colored and marked. They have piercing mouthparts and are blood feeders. Horn flies congregate about the back, shoulders, and horns; on hot days they are mostly on the shady side of the animal or on the belly. Horn flies seldom follow animals into barns or sheds.  <b>Face flies</b> (NHE 106) resemble house flies but are slightly larger and darker. Only females frequently visit cattle. They feed on secretions about the eyes, nose, and mouth.  <b>Stable flies</b> (NHE 61) resemble house flies but have a piercing proboscis that protrudes from the front of the head. Stable flies are blood feeders that often attack the lower portion of the front legs. Stable flies attack both pastured and feedlot cattle.	<b>Threshold Infestations and Adequate Levels of Control:</b> Horn fly infestations of up to 100 to 200 flies per animal produce little or no effect on the rate of gain. In Illinois, control programs utilizing dust bags or oilers often reduce horn fly infestations to 10 to 50 flies per animal. The use of dust bags or oilers provides adequate and economical control of horn flies and usually does not favor rapid development of insecticide resistance (as do ear tags).  Available data do not support any estimates of what constitutes an economically damaging number of face flies or an acceptable level of face fly control. Although face flies annoy cattle, even heavy infestations do not cause reductions in the rate of gain. Face flies can transmit the pathogen that causes pinkeye, but pinkeye outbreaks also occur in the absence of face flies.  Research indicates that as few as 1 to 5 stable flies per leg can reduce cattle performance in some conditions. Nonetheless, there are no effective insecticide applications for reducing stable fly attacks on pastured cattle. Although sprays directed at animals' legs may provide temporary relief, no long-term control is accomplished.  Moving cattle into shelters reduces annoyance by horn flies and face flies, but it does not deter stable fly attack.			
	Back rubber or face rubber (oilers)	Mix insecticides with No. 2 fuel oil, No. 2 diesel fuel, or a label-recommended mineral oil. Mineral oils are less irritating than fuel oils. Do not use waste oil or motor oil. Service the rubbing device at least one per week. Self-treating devices are effective only if they are used regularly. Place rubbing devices in the entryways to water or mineral feeders to ensure usage. Effective horn fly control can be achieved with forced-use oilers; partial control of face flies is provided by these devices. Oilers do not control stable flies.		
		Co-Ral 11.6% EC (coumaphos)	1 gal/13 gal fuel or mineral oil.	0 days.
		Delnav 15% EC or 30% EC (dioxathion)	2 qt 15% EC or 1 qt 30% EC/5 gal fuel or mineral oil.	0 days. Beef cattle only.
		Ectiban 5.7% EC (permethrin)	1 qt/10 gal diesel oil.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
		Permethrin II 10% EC (permethrin)	1 qt/20 gal fuel or mineral oil.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
	Dust bag	Dust bags are effective only if they are used regularly. Place them in the entryways to water or mineral feeders to ensure use. Keep dust bags dry and well charged; service at least once per week. Forced-use dust bags that contact the animal's face provide effective horn fly control and significant reductions in face flies; dust bags do not effectively control stable flies.		
		Co-Ral 1% D (coumaphos)	10 lb/bag.	0 days.
		Ectiban or Permethrin 0.25% D (permethrin)	10 lb/bag.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
		malathion 4% plus methoxychlor 5% D	1 10-lb bag/10-15 animals.	0 days. Beef cattle only.
	Feed additive	Rabon 3% D (stirofos)	4-8 lb/bag.	0 days.
		Altosid 0.02% (methoprene)	0.25-0.5 lb/100 lb body weight/animal/month.	0 days. Feed mineral mix or block from May to September.
		Rabon 97.3% or 7.76% Oral Larvicide (stirofos)	70 mg a.i./100 lb body weight/day.	0 days. Use from May through September. Mix with complete feeds, concentrates, or protein supplements.
	Bolus	Boluses release an active ingredient that prevents the development of face fly and horn fly larvae in treated dung. Stable flies do not develop in fresh dung and are not controlled by bolus use. Face flies and horn flies migrate considerable distances, so larval control in dung of a single herd may not substantially reduce fly populations if other herds in the area do not receive boluses or feed additives.		
		Vigilante 9.5% bolus (diflubenzuron)	1 bolus/550 lb body weight.	0 days. Use standard balling gun. Do not administer to animals weighing less than 300 pounds. No more than 2 boluses per animal. Boluses can be divided in half to achieve correct rate.



# Beef Cattle and Nonlactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
PASTURE FLIES, cont.	Ear tag or ear tape	<p>Ear tags and tapes impregnated with pyrethroid insecticides such as fenvalerate, flucythrinate, or permethrin effectively control horn flies (in the absence of resistance) and provide some control of face flies. They do not control stable flies. One tag or tape per cow will effectively control non-resistant horn fly populations for up to 20 weeks. Midseason control failures indicate horn fly resistance. Using 2 tags per cow and 2 tags per calf will improve face fly control; maximizing tagging rate will not overcome horn fly resistance. Attach tags in late May or early June after fly populations have begun to increase. Remove tags in September or October.</p> <p>Tags containing the organophosphates diazinon (Terminator tag) or pirimiphos-methyl (Tomahawk tag) effectively control horn flies (including pyrethroid-resistant horn flies), but they are somewhat less effective than pyrethroid tags for face fly control. Two tags per cow will provide horn fly control for approximately 16 weeks. Attach tags in late May or early June after fly populations have begun to increase. Remove tags in September or October.</p> <p>Tags containing cypermethrin (a pyrethroid) plus Dursban (an organophosphate) plus a synergist also are available (Max-Con tags). These tags do not effectively control pyrethroid-resistant horn flies.</p> <p>Horn fly populations in several locations throughout Illinois have developed resistance to pyrethroids in ear tags. To slow the development of resistance or manage pyrethroid-resistant horn flies:</p> <ol style="list-style-type: none"> <li>1. Delay applying pyrethroid tags until early-season horn fly infestations have reached 100-200 flies per animal.</li> <li>2. Use sprays, dust bags, or oilers containing an organophosphate (coumaphos, dioxathion, or stirofos) or a chlorinated hydrocarbon (methoxychlor) for fly control in some herds. Using dust bags or oilers provides the most economical control of horn flies. Use organophosphate-impregnated tags in some herds, but do not switch to complete reliance on any single tag. Do not use pyrethroid tags every year or on every herd; alternate with other treatment methods.</li> <li>3. Do not use sprays or dusts of pyrethroids to control flies not controlled by pyrethroid tags.</li> <li>4. Remove tags as soon as possible where resistance is evident (more than 100 horn flies per animal). Continuous exposure to pyrethroid tags prevents a decline in the level of resistance in the horn fly population.</li> </ol>		
		fenvalerate 8% tag (Ectrin, Insecta-Shield, Ear Tag Plus, Starbar, Vet Shack)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		flucythrinate 7.5% tag (Guardian)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		permethrin 10% tag (Atroban, Apollo, Expar, Insecta-Gard, Gard Star, Fearing Du-flex, Gen-Sal, Permethrin)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		permethrin 0.9 g tape (Ectiban)	1 tape per animal.	0 days. Remove in fall or before slaughter.
		diazinon 20% tag (Terminator)	2 tags per animal.	0 days. Do not apply to calves less than 3 months old. Do not apply to lactating dairy cattle. Remove in fall or before slaughter.
		pirimiphos-methyl 20% tag (Tomahawk)	2 tags per animal.	0 days. Do not apply to lactating dairy cattle. Remove in fall or before slaughter.
	Spray	<p>Sprays directed to animals should not contaminate feed or water. Do not use sprays containing fenvalerate or permethrin to control resistant horn flies that are not controlled by pyrethroid ear tags.</p>		
		Co-Ral 11.6% EC or 25% WP (coumaphos)	2 qt 11.6% EC or 2 lb 25% WP/100 gal water. Completely wet skin to runoff.	0 days. Do not apply to dairy cattle within 14 days of freshening.
		Delnav 15% EC or 30% EC (dioxathion)	1 qt 15% EC or 1 pt 30% EC/25 gal water.	0 days. Do not use more often than every 14 days. Do not use on dairy cattle or in dairy barns. Restricted-use.
		Ectiban 5.7% EC (permethrin)	1 qt/100 gal water. Thoroughly wet animals.	0 days. Repeat as needed, but not more often than once every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for control of pasture flies on cattle. Check product labels for dilution and application rate.		
		methoxychlor 25% EC or 50% WP	2 qt 25% EC or 2 lb 50% WP/25 gal water.	0 days. Do not use on dairy cattle or in dairy barns.
		Rabon 50% WP (stirofos)	4 lb/75 gal water. Use 1/2 to 1 gal/animal.	0 days. Beef cattle only.

# Lactating Dairy Cattle

Insecticides listed in this section are registered for use on lactating dairy cattle. Most insecticides listed for use on beef cattle can be applied to nonlactating dairy cattle if the specified interval between application and freshening is observed. Follow all label directions.

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE</b> (NHE 18)  $\frac{1}{16}$ to $\frac{1}{8}$ inch long. Biting lice are reddish, flattened, and active. Sucking lice are gray to blue and sluggish. Heavy populations cause reduced milk production and anemia. Symptoms are rough, patchy hair coats and a dirty appearance. Most troublesome in winter.	Dust bag	Place dust bags at milkroom exits. Keep bags charged and dry, and service at least once per month. (Co-Ral 1% dust and Ectiban and Permethrin 0.25% dusts can be used for direct hand-dusting; follow label directions.)		
		Co-Ral 1% D (coumaphos)	10 lb dust/bag.	0 days.
		Ectiban or Permethrin 0.25% D (permethrin)	10 lb dust/bag. Self-treating.	0 days.
	Spray	Apply sufficient spray to thoroughly wet each animal; use up to 1 gallon finished spray per animal. Do not contaminate feed, water, milk, or milking equipment.		
		Co-Ral 11.6% EC or 25% WP (coumaphos)	1 qt 11.6% EC or 1 lb 25% WP/100 gal water.	0 days. Do not treat calves less than 3 months old.
		Ectiban 5.7% EC (permethrin)	1 qt/100 gal water.	0 days. Repeat application 14-21 days after first treatment.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of lice on dairy cattle. Check product labels for dilution and application rates.)		
		Taktic 12.5% EC (amitraz)	1 qt/100 gal water. Use up to 2 gal per fully grown animal.	0 days. Apply spray within 6 hours after mixing. Repeat application in 10-14 days.
<b>CATTLE GRUBS</b>	No pesticides are currently registered for control of cattle grubs on lactating dairy cattle.			
<b>MANGE MITES</b>  Microscopic mites live on or within skin. Lesions vary with mite species. Infestations are greatest when cattle are crowded in shelters during winter.	Mange caused by chorioptic mites (barn itch mites) is the most common mite-induced disorder of Illinois dairy cattle. Infested cattle may or may not develop lesions; lesions usually appear as localized nodules that exude serum. Lesions are most prevalent from the tailhead to the hind heels. Insecticides listed for louse control on dairy cattle also control chorioptic mange. Cattle scabies (psoroptic mange) is a quarantinable disease. Its symptoms are lesions that occur first at the withers, over the back, and at the tailhead. The wounds itch, and rubbing leads to abscesses, especially on the shoulders and rump. Mites move to edges of scabs, causing lesions to enlarge and coalesce. Scabs may cover much of the body. Where cattle scabies is detected, contact the Illinois Department of Agriculture, Bureau of Animal Health, Illinois State Fairgrounds, Springfield, Illinois 62706, (217) 782-4944.			
<b>TICKS</b>  8-legged adults of most species are reddish brown and less than $\frac{1}{4}$ inch long. Engorged females may exceed $\frac{1}{2}$ inch in length. Ticks are blood feeders and disease vectors.	Ticks are rarely economically important on Illinois dairy cattle. Problems are most likely where cattle graze in brushy or wooded areas.			
	Spray	Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Do not apply more often than once every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of ticks on dairy cattle. Check product labels for dilution and application rates.)		
		Taktic 12.5% EC (amitraz)	1 qt/100 gal water. Use up to 2 gal per fully grown animal.	0 days. Apply spray within 6 hours after mixing. Repeat application in 10-14 days.
<b>MOSQUITOES</b>  Blood feeding. Annoyance may cause cattle to remain in buildings and reduce their grazing.	Mosquito populations are greatest near low, wet areas, ponds, and slow-moving streams. Reduction of mosquito breeding sites is necessary for long-term control. The insecticides listed below provide some short-term relief for treated animals, but frequent applications are not economical or recommended.			
	Spray (to animals)	Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt per animal.	0 days. Do not apply more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of mosquitoes on dairy cattle. Check product labels for dilution and application rates.)		
		pyrethrin (0.03-0.10%) plus synergist (0.5-1.0%)	Ready to use. Mist 1-2 fl oz/animal.	0 days. Do not wet skin. Do not contaminate feed, water, milk, or milking equipment. Repeat as necessary.



# Lactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>PASTURE FLIES (HORN FLIES, FACE FLIES, STABLE FLIES)</b>  <b>Horn flies</b> (NHE 59) are smaller than house flies but are similarly colored and marked. They have piercing mouthparts and are blood feeders. Horn flies congregate about the back, shoulders, and horns; on hot days they are mostly on the shady side of the animal or on the belly. Horn flies seldom follow animals into barns or sheds.  <b>Face flies</b> (NHE 106) resemble house flies but are slightly larger and darker. Only females frequently visit cattle. They feed on secretions about the eyes, nose, and mouth.  <b>Stable flies</b> (NHE 61) resemble house flies but have a piercing proboscis that protrudes from the front of the head. Stable flies are blood feeders that often attack the lower portion of the front legs. Stable flies attack both pastured and feedlot cattle.	<b>Threshold Infestations and Adequate Levels of Control:</b> In Illinois, control programs utilizing dust bags or oilers often reduce horn fly infestations to 10 to 50 flies per animal. The use of dust bags or oilers provides adequate and economical control of horn flies and usually does not favor rapid development of insecticide resistance (as do ear tags).  Available data do not support any estimates of what constitutes an economically damaging number of face flies or an acceptable level of face fly control. Although face flies annoy cattle, even heavy infestations do not cause reductions in milk production. Face flies can transmit the pathogen that causes pinkeye, but pinkeye outbreaks also occur in the absence of face flies.  Research indicates that as few as 1 to 5 stable flies per leg can reduce milk production in some conditions. Spraying cattle's legs as they exit the milkroom provides temporary relief, but no long-term control is accomplished.  Moving cattle into shelters reduces annoyance by horn flies and face flies, but it does not deter stable fly attack.			
	Back rubber or face rubber (oilers)	Mix insecticides with No. 2 fuel oil, No. 2 diesel fuel, or a label-recommended mineral oil. Mineral oils are less irritating than fuel oils. Do not use waste oil or motor oil. Service the oiler at least once per week. For self-treating devices to be effective, cattle must use them frequently. Place oilers in the entryways to water or mineral feeders or in the milking room exit. Well-used back rubbers or face rubbers will control horn flies and provide some face fly control. They will not control stable flies.		
		Co-Ral 11.6% EC (coumaphos)	1 gal/13 gal fuel or mineral oil.	0 days.
		Ectiban 5.7% EC (permethrin)	1 qt/10 gal oil.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
		Permethrin II 10% EC (permethrin)	1 qt/20 gal fuel or mineral oil.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
	Dust bag	For self-treating devices to be effective, cattle must use them regularly. Place dust bags in the entryways to water or mineral feeders or in the milking room exit. Keep dust bags dry; service at least once per week. Dust bags will control horn flies and provide some reduction in face fly problems. They will not control stable flies. (NOTE: Insecticide dusts listed below can also be used for direct hand-dusting; follow label directions.)		
		Co-Ral 1% D (coumaphos)	10 lb/dust bag.	0 days. Do not treat calves less than 3 months old.
		Ectiban or Permethrin 0.25% D (permethrin)	10 lb/dust bag.	0 days. Do not charge self-treating devices with permethrin if the treatment is intended to aid in delaying horn fly resistance to pyrethroids or to control resistant horn flies that are not controlled by pyrethroid ear tags.
		Rabon 3% D (stirofos)	4-8 lb/dust bag.	0 days.
	Spray	It is important that the following sprays do not contaminate feed, water, milk, or milking equipment. Do not use sprays containing fenvalerate or permethrin to control resistant horn flies that are not controlled by pyrethroid ear tags.		
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Re-treat as needed, but not more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for pasture fly control on dairy cattle. Check product labels for dilution and application rates.)		
		pyrethrin (0.1%) plus synergist	Ready to use. Apply 1-2 fl oz/animal.	0 days. Repeat as needed.
	Feed additive	Feed additives prevent the development of face fly and horn fly larvae in cattle dung. Stable flies do not develop in fresh dung and are not controlled by feed additives. Face flies and horn flies migrate considerable distances, so larval control in the dung of a single herd may not substantially reduce fly populations if other herds in the area do not also receive boluses or feed additives. Animals must consume the recommended dosage for the feed additive to be effective.		
		Rabon 97.3% or 7.76% Oral Larvicide (stirofos)	70 mg a.i./100 lb body weight/day.	0 days. Feed in complete feeds, concentrates, or protein and mineral supplements from May to September.



## Lactating Dairy Cattle, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
PASTURE FLIES, cont.	Bolus	Boluses release an active ingredient that prevents the development of face fly and horn fly larvae in treated dung. Stable flies do not develop in fresh dung and are not controlled by bolus use. Face flies and horn flies migrate considerable distances, so larval control in dung of a single herd may not substantially reduce fly populations if other herds in the area do not receive boluses or feed additives.  Vigilante 9.5% bolus (diflubenzuron)	1 bolus/550 lb body weight.	0 days. Use standard balling gun. Do not administer to animals weighing less than 300 pounds. No more than 2 boluses per animal. Boluses can be divided in half to achieve correct rate.
	Ear tag or ear tape	<p>Ear tags and tapes impregnated with pyrethroid insecticides such as fenvalerate, flucythrinate, or permethrin effectively control horn flies (in the absence of resistance) and provide some control of face flies. They do not control stable flies. One tag or tape per cow will effectively control non-resistant horn fly populations for up to 20 weeks. Midseason control failures indicate horn fly resistance. Using 2 tags per cow and 2 tags per calf will improve face fly control; maximizing tagging rate will not overcome horn fly resistance. Attach tags in late May or early June after fly populations have begun to increase. Remove tags in September or October.</p> <p>Tags containing the organophosphate Rabon (stirofos) provide fly control for approximately 6 weeks after application. The organophosphates diazinon (Terminator tags) and pirimiphos-methyl (Toma-hawk tags) should <b>not</b> be used on lactating dairy cattle.</p> <p>Horn fly populations in several locations throughout Illinois have developed resistance to pyrethroids in ear tags. To slow the development of resistance or manage pyrethroid-resistant horn flies:</p> <ol style="list-style-type: none"> <li>1. Delay applying pyrethroid tags until early season horn fly infestations have reached 100-200 flies per animal.</li> <li>2. Use sprays, dust bags, or oilers containing an organophosphate (coumaphos, dioxathion, or stirofos) or a chlorinated hydrocarbon (methoxychlor) for fly control in some herds. Using dust bags and oilers provides the most economical control of horn flies. Do not use pyrethroid tags every year or on every herd; alternate with other treatment methods.</li> <li>3. Do not use sprays or dusts of pyrethroids to control flies not controlled by pyrethroid tags.</li> <li>4. Remove tags as soon as possible where resistance is evident (more than 100 horn flies per animal). Continuous exposure to pyrethroid tags prevents a decline in the level of resistance in the horn fly population.</li> </ol>		
		fenvalerate 8% ear tag (Ectrin, Insecta-Shield, Ear Tag Plus, Starbar, Vet Shack)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		flucythrinate 7.5% tag (Guardian)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		permethrin 10% ear tag (Atroban, Apollo, Expar, Insecta-Gard, Gard Star, Fearing, Permethrin)	1-2 tags per head.	0 days. Remove in fall or before slaughter.
		permethrin 0.9 g ear tape (Ectiban)	1 tape per animal.	0 days. Remove in fall or before slaughter.
		stirofos 13.7% tag (Rabon)	1-2 tags per head.	0 days. Remove in fall or before slaughter.

## Hogs

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
MANGE MITES (AND LICE)				
Microscopic mites feed on or within skin and cause mange.		<p>Although mange mites and lice are blamed for substantial losses in swine production, controlled studies indicate that otherwise healthy pigs suffer little or no reduction in the rate of gain or feed efficiency when infested with mange mites and lice. Managing lice and mange mites remains an important step in swine production, but keeping every animal louse-free and mange-free through the time of sale and slaughter is probably <b>not</b> economically justified.</p> <p>Mange mites and lice are spread by direct contact among animals. They may survive off the host animal for short periods in bedding, but they do not infest animals other than swine. Prevent mange outbreaks by isolating and treating any new animals — especially boars — before adding them to the herd. Thoroughly clean and disinfect pens before using them to hold uninfested animals. To prevent infestation of newborn pigs, treat boars before the breeding season and treat sows 30 to 45 days before farrowing. It is often necessary to treat all animals in contact with those infested by mange mites or lice. It is also wise to isolate carrier animals to prevent the unnecessary spread of these pests from animal to animal.</p>		

## Hogs, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>MANGE MITES</b> cont.  <b>Sarcoptic mange</b> usually starts at the head and then spreads back; infested skin becomes dry, scurfy, or leathery. Rubbing may lead to raw or scabby areas.  <b>Demodectic mange</b> is characterized by hard, round swellings on or below the skin surface.	The insecticides listed below will help to control sarcoptic mange. There is no satisfactory chemical control for the hog follicle mites that cause demodectic mange. Isolate hogs with demodectic mange. Kill and destroy severely infested animals; market for slaughter the animals that are severely attacked. Clean and disinfect pens, sheds, and other infested areas before moving in uninfested animals.  Follow label precautions against the simultaneous use of organophosphate sprays, dusts, or pour-ons with similar medications used for internal parasite control. Do not contaminate feed or water.			
	Spray	Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Spray animals thoroughly.	5 days. Repeat application after 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for control of hog lice and mange. Check product labels for dilution and application rates.)		
		Ectrin 10% WDL (fenvalerate)	1 qt/50 gal water. Spray each animal thoroughly.	1 day. Repeat application in 14 days if necessary.
		lindane 12.4% EC or 20% EC	3 pt 12.4% EC or 1 qt 20% EC/100 gal water. Spray animals thoroughly.	30 days. Treat twice at a 7-day interval. Do not treat pigs less than 3 months old. Do not treat sows within 2 weeks before farrowing or 3 weeks after farrowing. Restricted-use.
		malathion 57% EC	1 qt/15 gal water. Treat animals, bedding, and walls thoroughly.	0 days. Do not treat pigs less than 1 month old. Repeat treatment after 10 days.
		Taktic 12.5% EC (amitraz)	1 qt/50 gal water. Spray animals, bedding, and walls thoroughly.	1 day. Apply spray within 6 hours after mixing. Repeat application in 7-10 days.
	Dust	malathion 4-5% D	Thoroughly cover animals over 1 month old. Also treat pens and bedding. Use ¼-½ tsp/pig for pigs less than 1 month old.	0 days. Repeat as needed. Gives only partial control of mange mites.
<b>LICE</b>  Up to ½ inch long. Hog lice are bluish black in color. They suck blood from infested animals.	Insecticides listed for controlling mange mites on hogs will also control lice. Do not contaminate feed or water. Follow label precautions against the simultaneous use of organophosphate sprays, dusts, or pour-ons with medications used for internal parasite control.			
	Spray	Co-Ral 25% WP (coumaphos)	2 lb/100 gal water. Spray each animal thoroughly.	0 days. Do not treat animals less than 90 days old. Apply a second spray 10-14 days after first.
		methoxychlor 50% WP	8 lb/100 gal water. Spray each animal thoroughly.	0 days. Make second application 14 days after first if needed.
	Dust	Co-Ral 1% D (coumaphos)	1 oz/animal.	0 days. Dust especially around shoulders and back. Repeat as needed, but not more than once every 10 days.
		Ectiban or Permethrin 0.25% D (permethrin)	1 oz/animal.	5 days. Make second application 14 days after first.
		Rabon 3% D (stirofos)	3-4 oz/animal; 1 lb/150 sq ft of bedding for severe infestations.	0 days. Do not re-treat for 14 days.
	Pour-on	Ectrin 10% WDL (fenvalerate)	1 qt/25 gal water. Pour 4 fl oz/animal on head and back midline.	1 day. Add wetting agent according to label directions. Repeat application in 14 days if necessary.
		Tiguvon 3% Pour-On (fenthion)	0.5 fl oz/100 lb body weight.	14 days. May be used on gestating and lactating sows. Do not re-treat within 35 days.

# Sheep

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>KEDS, LICE</b> (NHE 53)  <b>Sheep keds</b> (also called sheep ticks) are flattened, wingless, reddish brown flies about the size of house flies.  <b>Lice</b> reach $\frac{1}{16}$ to $\frac{1}{8}$ inch in length. Biting lice are flattened and yellowish to reddish in color. Sucking lice are oval and bluish gray.	Spray	Apply enough spray to thoroughly cover each animal.		Do not contaminate feed or water.
		Co-Ral 25% WP (coumaphos)	<i>Lice</i> : 2 lb/100 gal water. <i>Keds</i> : 4 lb/100 gal water.	15 days. Do not treat lambs less than 3 months old.
		diazinon 50% WP	0.5 lb/100 gal water. Use 1 gal/animal.	14 days. Use high pressure and volume. Do not treat lambs less than 2 weeks old.
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Repeat application in 14 days. Do not treat more often than every 14 days.
		Ectrin 10% WDL (fenvalerate)	1 qt/100 gal water. Wet each animal with up to 1 qt of spray.	2 days. Repeat application in 30 days if necessary. Do not apply more than twice in the spring and twice in the fall.
		malathion 57% EC	1 gal/100 gal water.	0 days. Do not treat lambs less than 1 month old.
		Marlate 50% WP (methoxychlor)	8 lb/100 gal water. Spray each animal thoroughly.	0 days.
	Dip	Co-Ral 25% WP (coumaphos)	<i>Lice</i> : 2 lb/100 gal water. <i>Keds</i> : 4 lb/100 gal water.	15 days. Do not dip lambs less than 3 months old.
	Dust	Co-Ral 0.5% D	Follow label directions.	15 days. Treat once after shearing. Do not treat lambs less than 3 months old.
		diazinon 2% D	1½ oz/animal.	14 days. Do not treat lambs less than 2 weeks old.
		malathion 4-5% D	1-2 oz/animal.	0 days. Repeat application in 2-3 weeks if needed. Do not treat lambs less than 1 month old.
		Marlate 50% WP (methoxychlor)	1 tbsp/animal.	0 days. Treat only once.
	Pour-on	Ectrin 10% WDL (fenvalerate)	2 qt/25 gal water. Pour 4 fl oz/animal down midline of back.	2 days. Add wetting agent according to label directions. Repeat application in 30 days if necessary. Do not apply more than twice in the spring and twice in the fall.
<b>WOOL MAGGOTS</b>  Cream-colored maggots are larvae of blow flies. Maggots live in wet, matted wool near the rear of the animal and in matted wool surrounding wounds.	Spray	Reduce wool maggot attacks by tagging sheep (shearing under the tail and between the hind legs), docking, and castrating before May. Practice good sanitation. Shear around and direct sprays to the infested areas.		
		Co-Ral 25% WP (coumaphos)	4 lb/100 gal water. Use 1 gal/animal.	15 days. Do not treat lambs less than 3 months old.
		diazinon 50% WP	0.5 lb/100 gal water. Use 1 gal/animal.	14 days. Do not treat lambs less than 2 weeks old.
<b>SCAB MITES (SCABIES, WET MANGE)</b>	Sheep scab is a quarantinable disease. Infested animals shed wool; skin becomes roughened and crusted. Where infestations are suspected, contact the Illinois Department of Agriculture, Bureau of Animal Health, Illinois State Fairgrounds, Springfield, Illinois 62706, (217) 782-4944.			
<b>HORN FLIES</b> (NHE 59) <b>FACE FLIES</b> (NHE 106)	Spray	Co-Ral 25% WP (coumaphos)	2 lb/100 gal water.	15 days. Do not treat lambs less than 3 months old.
		Marlate 50% WP (methoxychlor)	2 lb/100 gal water.	0 days. Repeat treatment every 3 weeks as needed.
		pyrethrin (0.05-0.10%) plus synergist (0.5-1.0%)	1-2 fl oz/animal.	0 days. Apply daily to head, neck, and front legs as a fine mist. Do not wet hair or skin.



# Goats

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE</b> (NHE 53)	Spray	Ectrin 10% WDL (fenvalerate)	1 qt/100 gal water. Wet each animal with up to 1 qt of spray.	2 days. Do not apply to lactating goats. Repeat application in 30 days if necessary. Do not apply more than twice in the spring and twice in the fall.
	Pour-on	Ectrin 10% WDL (fenvalerate)	1 qt/25 gal water. Pour 4 fl oz/animal down midline of back.	2 days. Do not apply to lactating goats. Add wetting agent according to label directions. Repeat application in 30 days if necessary. Do not apply more than twice in the spring and twice in the fall.
<b>FACE FLIES</b> (NHE 106), <b>HORN FLIES</b> (NHE 59), <b>STABLE FLIES</b> (NHE 61) <b>HORSE FLIES,</b> <b>DEER FLIES</b> (NHE 60)	Spray	pyrethrin (0.05-0.10%) plus synergist (0.5-1.0%)	1-2 fl oz/animal.	0 days. Apply to head, neck, and front legs as a fine mist. Do not wet hair or skin.

# Poultry

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE, NORTH-ERN FOWL MITES (BIRD TREATMENT)</b> (NHE 54)  <b>Chicken lice</b> are flat-bodied, straw-colored, 1/16-inch-long lice with chewing mouthparts. They feed on feathers and skin flakes, irritating birds. Severe infestations reduce egg production.  <b>Northern fowl mites</b> are dark red to black blood feeders that build up in the vent area. Mature mites are roughly 1/25 inch long. Feathers around the vent appear grayish or black from accumulation of mites, mite eggs, and excrement. Severe infestations reduce egg production and can cause death. Northern fowl mites are most troublesome in winter.	Spray	Co-Ral 25% WP (coumaphos)	<i>Lice:</i> 6 oz/5 gal water. <i>Mites:</i> 3 oz/5 gal water. Use 1 gal/100-125 birds, or 0.5 fl oz/bird.	0 days. Do not treat more than once per week. Do not treat within 10 days of vaccination or stress.
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1 gal/100 birds.	0 days. Treat vent area thoroughly.
		malathion 57% EC	1 fl oz/gal water. Use 1 gal/100-125 birds.	0 days. Repeat treatment in 4-8 weeks or when necessary.
		Permethrin II 10% EC (permethrin)	1 qt/50 gal water. Use 1 gal/100 birds.	0 days. Treat vent area thoroughly.
		Rabon 50% WP (stirofos)	6.5% oz/5 gal water. Use 1 gal/100 birds or 1 fl oz/bird using at least 100-125 psi.	0 days. Do not treat more than once every 14 days.
	Dust	Sevin 50% WP or 80% SP (carbaryl)	6 oz 50% WP or 4 oz 80% SP/5 gal water. Use 1 gal/100 birds.	7 days. Repeat treatment in 4 weeks if necessary.
		Ectiban or Permethrin 0.25% D (permethrin)	Use 1 lb/100 birds.	0 days. Apply with shaker or hand duster. Treat vent area thoroughly.
		malathion 4-5% D	Use 1 lb/100 birds.	0 days. Apply with shaker or hand duster.
		Rabon 3% D (stirofos)	Use 1 lb/300 birds.	0 days. Apply with hand or power duster. Do not treat more than once every 14 days.
		Sevin 5% D (carbaryl)	Use 1 lb/100 birds.	7 days. Apply with shaker or hand duster. Do not treat more than once every 4 weeks.
	Strip	Permethrin 10% strip (permethrin)	1 or 2 strips per cage of up to 9 hens.	0 days. For northern fowl mite control.

## Poultry, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE, CHICKEN MITES, NORTH-ERN FOWL MITES (POULTRY HOUSE AND LITTER TREATMENT) (NHE 54)</b>  <b>Chicken mites</b> (or roost mites) are bright to dark red and $\frac{1}{25}$ inch long. They hide in cracks and crevices during the day and feed on birds at night. They are most prevalent in spring, summer, and fall, not in winter.	Spray	Co-Ral 25% WP (coumaphos)	6 oz/5 gal water. Use 1 gal/1,000 sq ft.	0 days. Apply thoroughly to litter, walls, ceilings, floors, roosts, nests, and adjacent areas. Force spray into all cracks and crevices.
		malathion 57% EC	2 fl oz/gal water. Use 1 gal/1,000 sq ft.	0 days. Apply liberally to litter, walls, ceilings, floors, roosts, nests, and adjacent areas. Force spray into cracks and crevices.
		Rabon 50% WP (stirofos)	0.5 lb/6 gal water. Use 1-2 gal/1,000 sq ft.	0 days. Apply thoroughly to litter, walls, roosts, cracks, crevices, and interiors.
		Sevin 50% WP or 80% SP (carbaryl)	2 lb 50% WP or 1.5 lb 80% SP/5 gal water. Use 1-2 gal/1,000 sq ft.	7 days. Apply spray to walls, bedding, litter, and roosts. Force spray into cracks and crevices. Repeat as needed. Avoid contamination of nests, eggs, feed, and water.
	Dust	malathion 4-5%	1 lb/50-60 sq ft.	0 days. Apply liberally to litter, walls, ceilings, roosts, nests, and adjacent areas.
		Rabon 3% D or 50% WP (stirofos)	1 lb 3% D or 2.5 oz 50% WP/100 sq ft.	0 days. Treat litter evenly and thoroughly.
<b>DARKLING BEETLES (LESSER MEALWORMS)</b>  Cream-colored larvae infest decaying organic matter or moldy feeds. Can serve as intermediate hosts for poultry pathogens. Sometimes nest in and damage building insulation.	Spray	Rabon 50% WP (stirofos)	2 lb/25 gal water. Use 1-2 gal/1,000 sq ft.	0 days. Apply evenly and thoroughly to litter, walls, center posts, and foundation walls.
		Sevin 80% SP or 40% or 43.4% suspensions (carbaryl)	62.5 lb 80% SP or 50 qt 40% or 43.4% suspensions/100 gal water. Use 2 gal/1,000 sq ft.	7 days. Apply evenly and thoroughly to litter or floor surface. Do not apply directly to poultry, nests, or eggs. Repeat as needed.
	Dust	Sevin 5% D (carbaryl)	1 lb/40 sq ft.	7 days. Do not apply to eggs or nest litter. Do not treat more than once every 4 weeks.
<b>BED BUGS</b>  Flat, reddish brown, blood-sucking insects that feed at night. Rarely seen on birds during daylight.	Spray	Sevin 50% WP, 80% SP, or 40% or 43.4% suspensions (carbaryl)	8 lb 50% WP, 5 lb 80% SP, or 4 qt 40% or 43.4% suspensions/100 gal water. Use 1-2 gal/1,000 sq ft.	7 days. Apply thoroughly to walls, litter, and roost surfaces. Force spray into cracks and crevices. Do not apply directly to poultry, nests, or eggs. Repeat as needed.
	Dust	Sevin 5% D (carbaryl)	1 lb/40 sq ft.	7 days. Apply even to litter. Do not treat more than once every 4 weeks. Do not apply to eggs or nest.

## Horses

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>MANGE MITES</b>  Burrowing in skin causes pain and itching. Most prevalent in winter.	Spray	Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Repeat application in 14 days. Do not treat more often than every 14 days.
(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of mites on horses. Check product labels for dilution and application rates.)				

## Horses, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>LICE</b> 1/16 to 1/8 inch in length. Biting lice are yellow to red. Sucking lice are brownish to blue-gray. Head and neck, withers, and tailhead develop a scurfy appearance. Rubbing may create raw areas.	Spray	Co-Ral 25% WP or 11.6% EC (coumaphos)	0.5 lb 25% WP or 1 pt 11.6% EC/25 gal water. Treat animal thoroughly.	0 days.
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Repeat application in 14 days. Do not treat more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of lice on horses. Check product labels for dilution and application rates.)		
		malathion 57% EC or 25% WP	6.5-10 fl oz 57% EC or 0.75 lb 25% WP/5 gal water. Treat animal thoroughly.	0 days.
		Co-Ral 25% WP or 11.6% EC (coumaphos)	1 lb 25% WP or 1 qt 11.6% EC/25 gal water. Treat animal thoroughly.	0 days. Repeat as necessary.
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Do not treat more often than every 14 days.
<b>TICKS</b> Seldom a problem unless horses graze in brushy or wooded areas.	Spray	(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of ticks on horses. Check product labels for dilution and application rates.)		
		malathion 57% EC or 25% WP	6.5-10 fl oz 57% EC or 0.75 lb 25% WP/5 gal water. Treat animal thoroughly.	0 days.
<b>HORSE BOTS</b> Flies are nearly as large as honey bees. They deposit eggs on the forelegs, throat, or muzzle, area; fly activity severely annoys horses. Eggs are ingested; larvae (bots) develop within the horse's alimentary canal.	Feed additive	Anthon 90% Powder (trichlorfon)	5 g/250 lb body weight mixed with feed. Treat from mid-October to mid-December.	Nonfood use. Repeat after 3 to 4 months. Withdraw all feed 12-18 hours prior to and 3 hours after treatment. Do not treat colts under 4 months of age, mares in the last month of gestation, or horses to be used for food.
	Oral paste	Eqvalan 1.87% (ivermectin)	Ready to use. Follow directions on prefilled syringe.	Nonfood use.
		Equibot or Comboto (trichlorfon)	Ready to use. Follow directions on prefilled syringe.	Nonfood use.
	Stomach tube	Consult with a veterinarian for treatment with carbon disulfide, or piperazine + carbon disulfide (Parvex Plus).		
	Preventive spray	malathion 57% EC	During fall months, sponge legs, under jaw, and chest of animal with a warm 0.5% malathion solution.	0 days. Eggs will be stimulated to hatch and the larvae will be prevented from borrowing into the animal. Re-treat when more eggs accumulate. Do not use bare hands; use specially prepared gloves or rubber gloves.
<b>SCREWWORMS, BLOW FLIES</b> Maggots develop in wounds.	Spray	Co-Ral 25% WP (coumaphos)	1.3 oz/gal water. Treat wound lightly but thoroughly.	0 days.
		Co-Ral 3% Spray Foam (coumaphos)	Ready to use. Spray thoroughly so that foam completely covers wound.	0 days.
	Dust	Co-Ral 5% D (coumaphos)	Ready to use. Treat wound lightly but thoroughly.	0 days.



## Horses, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
<b>HORN FLIES, FACE FLIES, STABLE FLIES, HORSE FLIES, DEER FLIES, BLACK FLIES, MOSQUITOES</b>	Spray	Co-Ral 25% WP or 11.6% EC (coumaphos)	0.5 lb 25% WP or 1 pt 11.6% EC/25 gal water. Treat animal thoroughly.	0 days.
		malathion 57% EC or 25% WP	6.5-10 fl oz 57% EC or 0.75-1.25 lb 25% WP/5 gal water. Treat animal thoroughly.	0 days.
		Ectiban 5.7% EC (permethrin)	1 qt/25 gal water. Use 1-2 qt/animal.	0 days. Do not treat more often than every 14 days.
		(Additional permethrin formulations including emulsifiable concentrates of Insectrin, Permaban, and Permethrin II are registered for the control of biting flies on horses. Check product labels for dilution and application rates.)		
		Ectrin 10% WDL (fenvalerate)	4 fl oz/3 gal water. Mist 8 fl oz spray per animal. Direct at face, head, shoulders, and legs.	Do not treat animals intended for slaughter.
		pyrethrin plus synergist	Ready to use.	0 days. Apply as a mist spray. Do not wet the hide. Repeat as needed.
		Rabon 1% Spray-n-Wipe (stirofos)	Apply 1-2 fl oz to flanks, belly, and back.	0 days.
	Dust	Co-Ral 1% D (coumaphos)	2 oz/animal.	0 days. Apply to the head, neck, shoulders, back, and tailhead. Repeat as needed.
		malathion 4% D	4 tbsp/animal.	0 days. Apply evenly along back line. Repeat at 10-14 day intervals.
	Wipe-on	Rabon 2% Gel Wipe-on (stirofos)	1-2 fl oz/animal.	0 days. Apply as directed every 2-3 days if needed.

## FLY CONTROL IN LIVESTOCK BUILDINGS AND FEEDLOTS

Filth fly species that commonly inhabit livestock dwellings, feedlots, and nearby buildings include the house fly, stable fly, little house fly, and several blow fly species. These flies develop in a variety of moist, organic wastes including manure, spilled feed, decaying vegetation, and garbage. Common breeding sites are around feed bunks, at the edges of feeding floors, under fences, along stacks of hay or straw, and in accumulations of manure.

Although stable flies are biting flies that take blood meals from cattle, horses, and hogs, most other flies associated with confined livestock are nuisance pests, not blood feeders. Neither stable flies nor nonbiting nuisance flies spend much time on their animal hosts, so successful fly control around confined livestock does not center on animal treatments. The use of dust bags, oilers, or ear tags provides little or no control of flies in or around buildings. Sprays directed to the legs and belly of cattle, horses, and hogs (apply as recommended in preceding sections for horn fly control on individual livestock species) may provide short-term relief from stable fly attack, but such applications are not likely to significantly reduce the overall fly problem.

Thorough sanitation is the most important step in successful fly control. Weekly removal of manure, decaying hay and straw, and spilled feeds disrupts fly breeding sites frequently enough to prevent the development of fly larvae. Removing wastes beneath feeders and along fences is especially important. If manure is temporarily piled before spreading, cover it with black plastic to prevent flies from entering or leaving this potential breeding site. If manure is not removed weekly, leaving an 8-inch-thick manure residue at each cleanup may help to maintain populations of insect predators and parasites that limit fly populations. Poultry producers who do not remove manure weekly can maintain predator and parasite populations by removing manure from beneath only one row of cages at each cleanup.

Insecticide applications may be necessary in addition to good sanitation. Unless otherwise indicated, premise treatments listed below can be used in beef, dairy (other than milking rooms), swine, sheep, goat, poultry, and horse facilities. Separate recommendations for fly control in milking rooms are provided.

# Fly Control

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
HOUSE FLIES, STABLE FLIES, BLOW FLIES, ETC.	Space spray from mist blower or fogger	To minimize control failures caused by insecticide resistance, do not apply a single insecticide repeatedly throughout an entire season. Alternate applications of pyrethroids (permethrin products) and an organophosphate (naled). Space sprays (aerosols) provide rapid control of adult flies present at the time of application. Close doors and windows to reduce air movement during treatment. Daily to twice-weekly applications may be necessary where space sprays are the only treatments used. Animals may be present during application, but space sprays should not be applied directly to livestock. Do not apply space sprays in areas where animals have been treated directly with an insecticide during the previous 24 hours. Do not contaminate feed or water or use in milking rooms.		
		Dibrom 36% EC or 1% Ready-to-use Spray (naled)	1 qt 36% EC/40 gal water. Apply throughout building. Use 1 fl oz of 1% Ready-to-use Spray/3,000 cu ft.	0 days.
		Ectiban 5.7% EC (permethrin)	Misting: Use 4 fl oz/1,000 cu ft.  Overhead system: 1 qt/12.5 gal fuel or mineral oil; use 4 fl oz/1,000 cu ft.	0 days.
		Permethrin II 10% EC (permethrin)	Misting: Use 4 fl oz/1,000 sq ft.  Overhead system: 1 qt/12.5 gal fuel or mineral oil; use 4 fl oz/1,000 cu ft.	0 days.
		pyrethrins plus synergist	Follow label directions.	0 days.
	Surface residual spray	To minimize control failures caused by insecticide resistance, do not apply a single insecticide repeatedly throughout an entire season. Alternate applications of pyrethroids (permethrin, fenvalerate) and organophosphates (fenthion, dimethoate, stirofos). Surface sprays applied to walls, ceilings, partitions, posts, etc. kill flies at their resting sites and provide residual activity for 1-7 weeks. Products (or the listed concentrations of these products) recommended for use as residual sprays should not be applied directly to animals. Thoroughly spray surfaces to the point of runoff. Do not contaminate feed or water, and do not use residual sprays in milking rooms.		
	Baytex 45% EC (fenthion)	3 qt/25 gal water. use 1 gal/500 sq ft.	0 days. Residue persists 3-5 weeks.	
	Cygon 23.4% EC (dimethoate)	1 gal/25 gal water. Use 1-2 gal/1,000 sq ft.	0 days. Remove all animals before spraying. Keep them out for at least 4 hours. Do not use in dairy barns or poultry houses. Residue persists 2-4 weeks.	
	Ectiban 25% WP or 5.7% EC (permethrin) (Atroban, Insectrin, Overtime, Permaban, and Permethrin II are other permethrin products registered for use as surface residual sprays.)	6 oz 25% WP/11 gal water or 1 qt 5.7% EC/12.5 gal water. Use 1 gal/750 sq ft.	0 days. Residue persists 3-7 weeks.	
	(Pounce is another permethrin product that can be used as a residual spray. It is classified for restricted use; do not apply Pounce directly to poultry or livestock.)			

## Fly Control, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
HOUSE FLIES, STABLE FLIES, BLOW FLIES, ETC., cont.	Surface residual spray, cont.	Ectrin 10% WDL (fenvalerate)	1 qt/10 gal water. Use 1 gal/750 sq ft.	0 days for swine buildings. Use only in swine buildings and in horse barns where horses are not to be slaughtered. Residue persists 3-7 weeks.
		Rabon 50% WP (stirofos)	4-8 lb/25 gal water. Use 1-2 gal/1,000 sq ft.	0 days. Residue persists 2-4 weeks.
	Bait	Baits may enhance house fly control; they do not attract stable flies. Bait applications of insecticides used in surface residual sprays can be prepared by adding sugar or corn syrup to the spray tank mixture. Follow directions on individual product labels. Dry baits can be sprinkled in areas where flies congregate. Do not place dry baits in areas where birds or animals will contact the bait. Do not contaminate feed or water.		
		Dipterex 1% Dry Bait (trichlorfon)	4 oz/1,000 sq ft.	0 days.
		Golden Malrin 1% Dry Bait (methomyl)	4 oz/1,000 sq ft.	0 days.
	Manure spray	Manure sprays control fly larvae that are developing in treated feces. Migration of adult flies from nearby areas can occur if any breeding sites remain untreated. Manure sprays are recommended only where manure cannot be removed on a weekly basis. Apply sprays at rates that wet the manure surface; soaking is not necessary. Repeat applications as necessary, but not more often than every 7 days. Do not apply where mammals or birds will come in contact with the manure. Do not apply treated manure to crops not listed on the insecticide label.		
		Cygon 23.4% EC (dimethoate)	0.5 pt/5 qt water. Apply as a coarse spray.	0 days.
		Larvadex 5% SC (cyromazine)	1 qt/25 gal water. Use 1 gal/100 sq ft manure, pit, or lagoon surface.	0 days.
		Rabon 50% WP or 24% EC (stirofos)	4 lb 50% WP or 1 gal 24% EC/25 gal water. Use 1 gal/100 sq ft manure.	0 days.
	Feed additive	Feed additives used to prevent the development of fly larvae in feces provide minimal control of flies in livestock buildings. Feed additives do not reach house fly and stable fly larvae that develop in sites other than fresh manure. Good sanitation more effectively prohibits larval development. Animals must consistently consume recommended dosages for feed additives to be effective against fly larvae in manure.		
		Larvadex 0.3% Premix (cyromazine)	1 lb/ton of feed. Mix thoroughly.	Poultry only. Feed to laying hens only; not for broilers or poultry producing eggs for hatching purposes. Continuous use of cyromazine has led to fly resistance in research trials.
		Moorman's 0.02% IGR (methoprene)	0.25-0.5 lb/100 lb body weight/animal/month.	0 days. Feed mineral mix or block from May through September. Beef cattle and dairy cattle only.
		Rabon 7.76% or 97.3% Oral Larvacide (stirofos)	70 mg a.i./100 lb body weight/day.	0 days. Use from May through September. Mix with complete feeds, concentrates, or protein supplements. For beef cattle, dairy cattle, or hogs only.



## Fly Control, continued

Pest	Treatment method	Insecticide and formulation	Dilution and rate	Preslaughter interval, restrictions, comments
HOUSE FLIES, STABLE FLIES, BLOW FLIES, ETC., cont.	Biological agents	Several companies sell parasitic wasps for use in controlling flies around livestock buildings and feedlots. These predaceous wasps attack only flies; they do not sting (or bite) other insects, animals, or humans. Adult wasps (less than 1/10 inch long) deposit eggs on or inside fly larvae or pupae. Developing wasps kill the immature flies. Suppliers usually recommend wasp releases (several thousand wasps per release) before and during the fly season.  Most biological control programs recommend periodic (but not complete) removal of manure, effective water management, and control of weeds around feedlots and buildings. Some suppliers also recommend certain insecticide applications to supplement the control provided by biological agents. In many instances it is difficult to assess the separate impacts of parasitic wasps, sanitation practices, and insecticide applications. Although wasp releases have been shown to be effective for fly control in certain poultry housing, research data do not support other uses of currently available biological controls for flies. If biological control agents are to significantly contribute to fly control programs, integration with sanitation and chemical control practices is essential.		
CONTROL OF FLIES IN MILKING ROOMS	Although effective fly control is essential in dairy barns and milkrooms, small amounts of pesticides can be detected in milk, and their presence is often illegal. To control flies and avoid residue problems, the following steps are recommended: <ol style="list-style-type: none"><li>1. Use good sanitation and recommended insecticides in dairy barns to reduce the number of flies entering the milkroom.</li><li>2. Use sticky fly strips where appropriate.</li><li>3. Use tight screens (14-16 mesh) on milkroom doors and windows. Copper, aluminum, bronze, plastic, or rust-resisting screens are best.</li><li>4. Use a mist or aerosol spray of 0.06-0.1% pyrethrin plus piperonyl butoxide oil-based fly sprays in the milkroom when other methods do not give adequate fly control. To prevent milk contamination, cover all milking utensils, cans, bulk tanks, and containers before spraying.</li></ol>			
RATTAILED MAGGOTS	The rattailed maggot is the larval stage of a syrphid fly. The 1¼ inch long maggot has a cylindrical body about ¾ inch long and a tail-like breathing tube that extends ½ inch from the posterior of the body. The adult fly is a beelike hover fly that is not a pest on or around livestock or humans.  Rattailed maggots live in highly polluted water such as that in livestock lagoons and manure pits. When larvae are ready to pupate, they migrate from lagoons and pits to adjacent, drier areas. They become pests when they enter feed, egg cartons, and milking rooms.  To limit rattailed maggot development, eliminate floating solids within pits and keep pit sidewalls clean. Agitate the pit contents or pump the pit weekly. Although insecticides are of limited value in managing rattailed maggots, application of Ravap or Larvadex to the pit surface provides some control. Use 1 pint Ravap 28.7% EC per 3½ gallons fuel oil and apply 1 gallon of the spray mixture per 100 square feet of pit surface. (Do not agitate the pit contents after application.) Repeat applications as needed, but not more often than every 7 days. Use 1 quart Larvadex 5% SC per 25 gallons water and apply ½ to 1 gallon of finished spray per 100 square feet of pit surface.  Limit rattailed maggot migration by constructing a soil barrier between the pit and the milking room. Migrating larvae will burrow into the loose soil to pupate instead of continuing their migration into milking rooms, etc.			

**Diatomaceous earth.** The insecticidal activity of a range of chemically inert dusts, including diatomaceous earth, results from their abrasiveness and/or their sorptive characteristics. To understand how these dusts kill insects, it is important to recognize that an insect's body covering, the cuticle, contains fat layers that make the cuticle nearly water-proof and prevent water loss. Sorptive dusts absorb fats, disrupting the cuticle's water-proof nature. Abrasive dusts damage the insect's water barrier by actually scratching or cutting the cuticle. Where inert dusts are effective as insecticides, dehydration usually causes the insect's death.

For animal ectoparasite control, sorptive and/or abrasive dusts have been used somewhat successfully for reducing populations of lice, fleas, and some mites on a range of animal species and humans. Although most trials have evaluated silica aerogels, diatomaceous earth was used effectively to control cattle-biting lice in a study conducted in the 1930s. Silica aerogels were used at a

rate of 1 to 2 ounces of dust per cow; diatomaceous earth was applied at a rate of 3 ounces per cow. Based on available evidence, it is likely that although diatomaceous earth will not work as well as currently available chemical insecticides, if applied thoroughly and repeatedly, it should provide some control of lice, fleas, and certain mites. Because of the skin-burrowing habits of swine mange mites, producers should not expect diatomaceous earth to control this pest.

Advertisements claim that diatomaceous earth used as a feed additive will provide control of internal parasites and also control fly larvae in animal manure. Sales materials also include claims of controlling adult flies by aerosol, dust bag, or hand-dusting applications of diatomaceous earth to barns and animals. No reliable data support these claims of fly control. Negative data and an understanding of fly breeding and migration lead to the conclusion that little or no fly control is likely to be achieved by using diatomaceous earth.







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